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A Report

ON

SLEEPING SICKNESS IN THE VOLTA RIVER DISTRICT OF THE GOLD COAST COLONY WITH SUGGESTIONS FOR DEALING WITH IT

BY

ARTHUR E. HORN, M.D., B.Sc.
West African Medical Staff.

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PART I.

In July, 1909, I proceeded to the Volta River District in the south eastern part of the Colony, to enquire as to the presence and extent of Sleeping Sickness in that part, to select the site of a screened hospital for such cases, and to report on what measures could best be taken to stop the progress of the disease.

From that time until the middle of January, 1910, I have made frequent journeys round the borders of the Colony from Daino to Pode, as well as throughout the country between Daino and Kpeve to the north and Akuse to the south, visiting and inspecting all the larger towns, enquiring and examining for cases of Sleeping Sickness and enlarged glands, and treating various sickness and disorders. My headquarters I made at Anum and in the intervals of travelling, particularly in September when travelling was impracticable owing to prolonged rains and floods, patients were encouraged to come to Anum for treatment, and careful examination made of all such cases.

During this period a large number of natives have been seen and examined throughout the district, and it may be at once stated that, although Sleeping Sickness is endemic in this part of the Gold Coast, and has been known to the natives for many years past, yet it is not at present in epidemic form, neither does it appear to have produced any epidemic within the memory of living natives, nor does it form any profound part of their traditions.

The term "Volta River District" includes the important districts of PEKI, ANUM, and part of AKWAMU lying east of the river Volta. The whole is separated, largely by an artificial boundary, on the east and north from German territory (TOGOLAND) which on the north extends to the left bank of the Volta; south of the 6. 20 parallel the district is continued farther eastward on to the Quittah district which is more sparsely populated, and in which I did not travel farther east than Pode, a town on the border. I was however in constant touch with it by means of officers of the Preventive Service, and found there was no epidemic or marked native mortality; the country consists of open grass plains with numerous fan palms.

While Akwamu is under its own chief, the paramount chief of Anum and Peki is one Kudjo Dey of Peki. Apart from the Akwamus, who are a distinct race, the inhabitants of the district are Krepis, with the exception of about eight towns (including Anum) settled and occupied by Akwapim.

The houses are single-storied mud huts with thatched roofs, in some cases separated by a little space from one another, in others built round a hollow square after the style of Ashanti houses, the rooms opening on the yard or compound.

"Mosquito nets," made of thin cloth, are by no means uncommon throughout and are used, probably by the head of the family, for resting in by day and night. In most cases the villages are comparatively clean, but the forest or bush grows right up to the outskirts. The people are mainly engaged in agriculture, trading and cocoa farming, with a certain number of hunters and fishermen in the villages near the Volta,

The country is extremely hilly, most of the ranges runn ng roughly north-east and south-west. It is almost entirely covered with forest, less high than the forests of Ashanti but with the same dense undergrowth, and extending over the hills as well as the valleys; patches of open grass country with small trees occur occasionally. It is traversed by important trade routes as follows. Cattle from Kpnado and north Togoland enter the Colony mainly at British Kpeve and pass south through Todome, Ajakoi, Tsibu, Peki-Blengo, Nkwakubio Apopotia (Afrancondua), on to the Volta ferry between Agoli and Senkyi; this is the main route but another road of importance from the north, *i.e.* from Kratchi, enters at Daino and runs south through Tonkor, To, Parema, Bosso, Anum, Nkwakubio and so on to Senkyi as above. On the eastern side, cattle and traders from Ho, and adjacent parts of Togoland, enter the Colony at Anjirawase, passing south through Tsito (Awudome) then either through Nkwakubio or Asekuma to Senkyi. Of less importance on the eastern side are the roads of Apopotia and Pode; they are continued on to Senkyi.

It will be noticed that all the routes converge on the Agoli-Senkyi ferry over the River Volta, which is the chief entrance into the main part of the Colony from this part of the Colony. The only other Volta ferry in this district is that near Anum, from Labo-Labo to Pesse, which is less used, and practically only by passengers.

With the notable exception of the road which connects Tsito with Wudome, over the Eveto Range, and is used considerably by traders, all the roads pass as far as possible along the valleys, through forest country with occasional patches of open country with high grass, and crossing frequent small watercourses and rivulets.

The district is a populous one and there is much communication both between it and Togoland and between it and the main Colony, while the Volta itself is largely used for traffic north and south.

I have given this somewhat detailed description of the country because of the very important bearing it naturally has on the question of eradicating Sleeping Sickness in this part. It is obvious that a country such as described affords almost ideal facilities both for breeding and harbouring Tsetse flies as well as many other kinds of biting and bloodsucking insects, and I found that such flies occur abundantly along the roads, and in the villages in every part of the district. I have caught and been caught by *Glossina palpalis and morsitans* in practically every road, and almost every village throughout but I have not succeeded in catching any other variety of Tsetse.

Glossina palpalis and *morsitans* occur together in practically equal numbers. They were especially numerous in August in the roads to the north, particularly between Todome and To and Daino, where there were frequently as many as five or six flies settling and endeavouring to bite at one time, so that in some places it was a prolonged struggle, not to avoid being bitten, but to reduce the number of bites to a minimum. They are extremely pertinaceous, and have not the least objection to biting through clothes - either light coloured khaki breeches or dark coloured bush shirts. I have found them active and biting at all times from sunrise to dusk. There is a marked difference between the bites of the two varieties, *Glossina morsitans* producing a sharp painful stab which readily calls attention to its presence as soon as the proboscis is inserted, while *Glossina palpalis* is able to bite and feed full without its victim being aware of it. I have several times, by a chance slight movement of my arm on my hammock or the arm-rest of my chair, squashed a *Glossina palpalis*

which has been gorged with my blood while I have heen totally unconscious of its presence, and I have only discovered that I had been bitten by noticing the blood-stain and finding the injured fly. There is little or no irritation following a bite from which the fly has fed full.

It is interesting to note that while the flies were very prevalent in August, immediately before the latter rains, there was a very marked diminution in their numbers after the latter part of September, so that places formerly literally swarming with them were two months afterward very nearly free from them. How far this is part of a normal periodicity cannot be certainly known without longer observation, but it is possible that the usual course of events may have been modified by the exceptionally heavy "latter rains" of this year, which lasted from the end of August until well into November, and by the condition of the Volta which formed the highest flood known for sixteen years, and consequently overflowed its bank in many places, flooding a good deal of the lower lying country.

In such a country it would appear that Sleeping Sickness would be most likely to be present and flourish, for, on the face of it, everything seems in its favour, as far as our present knowledge extends.

It is a disease well known to the natives, and though they recognize that when the characteristic symptoms are well developed it terminates fatally, they certainly do not stand in any great fear of it. By their own statements it does not produce any large mortality, and some villages claim that, though they have heard of the disease, they have no personal knowledge of it. No stress can however be laid on statements such as this, because they are aware of, and dislike, the steps taken in Togoland to deal with the disease—including the

removal of cases from their homes and isolation in the Sleeping Sickness camp—and they probably think that the easiest way of avoiding unpleasantness is to disclaim all knowledge of the disease.

The people, in almost every case, were suspicious of my visit during my earlier tours—in many instances several of them running away into the "bush" on my approach; this I found to be partly due to nervousness consequent on an investigation of the neighbourhood made during the plague operations in Accra, when it was suspected that some of these towns might be infected with plague. Some care therefore had to be exercised in order to see and examine these people; it was impossible to insist on every inhabitant presenting himself for examination, because there are no means of checking the number of persons living in the town; and it is quite certain that any such attempt would have driven a very large proportion of the population into hiding. While therefore making definite enquires for cases of Sleeping Sickness and enlarged glands, I saw and treated all other cases of sickness, so that I was able to make a large number of examinations for enlarged glands and to puncture those at all likely to be produced by Sleeping Sickness.

In my later tours, when I had to some extent succeeded in gaining their confidence, they made no difficulty about bringing to me all cases of lymphatic enlargement that they could discover and indeed, in some towns it became apparently a fashionable recreation to have their glands submitted to aspiration by a hypodermic needle.

While the percentage of enlarged and palpable cervical glands is very high amongst children up to about ten years of age (roughly about 50%), I found the percentage amongst adults to be less than I had expected, and not more than about 10% of those I examined presented cervical enlargement. This high percentage in children is not produced by Trypanosomiasis, but by

such conditions as Pediculi capitis, Stomatitis, Otorrhoea, Ulcers or Sores on the head or face, and other affections arising from dirt, and I found Trypanosomes in the glands of only two of the numerous children I examined. In children, as in adults, inguinal and femoral glands are palpable in almost every case and, although I aspirated a fair number of axillary and femoral glands, I never succeeded in finding Trypanosomes.

In examining suspicious cases I made two fresh films of the lymph juice of palpable glands and spent twenty minutes over the examination of each; when no Trypanosomes were found, a fresh blood film was examined in the same way. Dried lymphatic and blood films were also made, stained by Leishman's modification of Romanowski's method and examined at leisure. It is perhaps worth noting that the living and moving Trypanosomes in a fresh film are very much more easily discovered than those stained and fixed in a dried film; the moving currents of lymph or serum, when followed up, frequently discover an actively moving Trypanosome.

Although cervical glandular enlargement is certainly a frequent indication of Sleeping Sickness, I have found very suspicious cases of the disease in which the glands were practically impalpable or only aspirated with difficulty, and in whom no Trypanosomes could be demonstrated in either the lymph-juice or blood. No lumbar puncturers were performed. In each of these cases there was debility, more or less loss of flesh, some tremor and lethargy; they were regarded by their friends as suffering from Sleeping Sickness. I have a list of those patients examined who, it appeared to me for any reason, might possibly be infected although there were not sufficient grounds for regarding them as suspicious. I could not depend on Auto-agglutination which in some cases occurred, but was absent in others; while it appears to point to some pathological state of the blood, it is probably not pathognomonic of Trypanosomiasis.

In the list referred to, I have entered particulars of parentage, village, condition of glands, symptoms, &c., to enable such people to be under future observation as necessary.

The sole two definite cases of Sleeping Sickness that I have discovered are two children—boys about eight or ten years of age. One of these cases occurred at Parema, the other at Anum. The other occupants of the houses have been carefully watched, blood examinations being made, as none of them had glands sufficiently enlarged to aspirate.

Atoxyl was administered by mouth in the above two cases and in three other cases which I regarded as Sleeping Sickness, without discovering the Trypanosome, by doses of 5 grains on the 7th and 8th days, for children increasing each dose, after three such periods, by 1 grain up to 7 grains. One suspected adult certainly showed temporary improvement after doses of 8 grains given in the same way, but no improvement has occurred in the two boys, whose treatment was supplemented by 3 min. doses of Liq: Arsen: Hydrochlor: without any signs of arsenical poisoning occurring. Vomiting occurred once or twice after the Atoxyl, but on the whole it was well taken.

I should have preferred to give the drug by intramuscular injection, but to the difficulties and risks of such an injection in the dirt of a native hut rendered it, to say the least, inadvisable, as no proper attention or nursing could be maintained.

Natives regard enlarged cervical glands as a sign of the disease, and their excision by native medicine-men is commonly performed by way of treatment. In every town are numerous children and adults with scars of such excisions, most of them old scars and present in people who now, some years after the operation, show no signs of the affection, so I have no doubt that the glandular enlargement was due to other causes than Trypanosomiasis.

Of definite cases "*en bon etat*," I have found none.

House to house examination was made in several towns where there was some suspicion that there might be cases not brought before me, but such visits never revealed any fresh case.

I found it quite futile to expect any assistance from the headmen of the villages in finding cases of Sleeping Sickness. Their position is one of indifference, and occasionally of passive obstruction. They have invariably denied the existence of the disease in their villages, and have not sufficient authority over their people to induce them to undergo medical examination against their wish. I have explained carefully to the chiefs and people of the towns I visited, both the nature of the disease, and the means by which it was spread from person to person, enlarging on its danger as proved in other parts of Africa and have pointed how, by sheltering and isolating their sick, and protecting themselves from the bites of the Tsetse fly, they might effectually stamp out the disease. I do not however believe that any material effect was produced, in spite their promises to carry out my instructions; as I have already said, they do not look on the disease with any fear, and as they regarded enlarged glands in children as an early indication of it, they consider they are able to treat and cure the sickness by excision of the glands if necessary.

While the origin of this fallacy is plain when the numerous other causes of enlarged lymphatic glands in children are considered, it still remains a very remarkable thing that—in a country where Sleeping Sickness is present, and has been present for some years, and where all the conditions for its spread are, as far as at present known, almost ideal,—the disease has not made greater headway and depopulated the country. As a result of six months' work in this district (an area roughly of about 350 square miles) I have only discovered two

definite cases of Sleeping Sickness, in whose tissues I have recognized the causative element, and three cases which I regard as Sleeping Sickness but have not hitherto been able to prove by finding the Trypanosome.

It is not to be supposed that every case of Sleeping Sickness in the district has been found, but I believe that I am justified in concluding that the disease does not prevail largely at present—a conclusion which is supported by such minor evidence as the large number of infants and small children in every town, which would not be expected in a country ravaged by a disease, a common early symptom of which is sexual impotence.

Whether this condition is due to a previous comparative absence of the essential transferring agent, in which a developmental cycle of the Trypanosome occurs, or which simply spreads the disease by purely mechanical means, or whether it is due to a relative immunity acquired by a people subject to the disease for possibly many generations, I cannot pretend to offer an opinion as the result of this short investigation. The abnormally heavy rains and floods of the year 1909 in the Volta River District and more remote hinterland may easily have provided such increased facilities for the breeding of *Glossinae* as to favour an exacerbation of the disease in the near future, although all conditions appear to have been sufficiently favourable before. On the other hand, Trypanosmiasis may be compared with Malaria—a protozoal disease to which natives show a marked relative immunity, the parasite being easily demonstrated in the blood of infants and young children suffering from malarial fever, but found with much more difficulty in the blood of adults who suffer less severely.

The fact however remains that here is a country in which Sleeping Sickness is present, together with every factor for its spread, and this undoubtedly constitutes a serious menace to other parts of the Colony. It is

therefore imperatively necessary that steps should be taken, both to control the disease in this district, and to prevent its spread into other parts of the Colony or into Togoland, and I suggest that the following measures are advisable.

PART II.

1. A SCREENED HOSPITAL for the reception and treatment of cases. This is now being erected at Anum, and will shortly be ready for occupation (see Appendix I).

2. CLEARING OF BUSH which affords protection to the fly. If I have made it clear that the Volta River District naturally consists almost entirely of forest with dense undergrowth, it will be readily understood that a general clearing of bush is entirely out of the question and so need not be further considered. There is an interesting difference in this respect between this district and the adjacent parts of Togoland that I visited between Kpakple and Mount Kluto, which country consist very largly of grass plains with occasional groups of trees; it is far less hilly and less wooded than the Volta River District.

I made an experimental clearing at Daino, where I found more varieties of biting flies than in any other place but it was impossible to continue it to any useful extent. Clearings should however be made with advantage as follows :—

(a) *Villages.* The undergrowth and smaller trees round all villages should be completely removed and burnt for a belt of 100 yards round the entire village, the space planted with Bahamas grass (Doube grass) and the clearing maintained. Citronella grass is not found in West Africa to be of any value in repelling Tsetse flies, it gives no odour until crushed and harbours

snakes whereas Bahamas grass, by its spreading, tends to destroy the forest undergrowth and does not grow high enough to afford protection to Tsetse flies. It should be easily within the power of each village to make such a clearing for itself. After it is first made, a week or two should elapse and then all grass and seedlings which have grown in the meantime should be hoed up and burnt before they have had time to seed; Bahamas grass should then be planted and any future seedlings or weeds removed by hand-pulling. Stumps should be charred or ringed to destroy them.

The suggested width of the belt (100 yards) is not so great as I should like but, taking into consideration the difficult nature of the country, it is as wide as practicable to begin with; should it not afford effective protection to the village, it can be afterwards increased.

(*b*) *The Village Watering-Places & Pit-Latrines* should be similarly cleared, the former for a radius of 100 yards round; the latter will probably be included in the village belt.

A great difficulty is the question of work on the farms. Plantations of yarm, cassada, coco-yam, &c., are the main source of the native food supply; they are small clearings scattered round the villages at any distance up to a mile or more, and approached by " bush tracks " through the forest. When work on the farms is necessary, practically the entire village turns out to them and, as their clothing is of the scantiest during the hard manual labour of these occasions, it is probable that they are considerably bitten by tsetse flies.

I confess I do not see how this is to be easily avoided.

(c) *Roads* should be kept clear and as far as possible extended from their present width—about 8 to 10 feet—to a width of 20 or more feet, with clearance of undergrowth along the sides.

(d) *Ferries* over the Volta are in all cases well kept and cleared on the right bank, where the Preventive Service Station is situated, but the clearing is not sufficiently extensive to render them entirely free from fly. It should be extended, and the ground planted with Bahamas grass, for 50 yards on each side of the station along the river front, and for the same width round the entire station. The low bush growing on the steep river bank particularly must be cut down and replaced by grass.

At Agoli and Labo Labo, respectively, opposite the Preventive Service Stations of Senkyi and Pesse, clearings should be made for 200 yards along either side of the road by the river, leading to the ferry, following the principles laid down by Dr. Hodges, Principal Medical Officer of Uganda. (Sleeping Sickness Bureau, January, 1909).

The following ferries are those concerned, and these remarks should apply to all.

Between SENKYI AND AGOLI
" PESSE AND LABO LABO
" NKAMI AND GABE (in Togoland)
" BRITISH KRATCHI AND KETE-KRATCHI (in Togoland)

At Labo Labo is the experimental farm of the British Cotton Growing Association, and it is unfortunate that the considerable area under cultivation for cotton harbours innumerable *Glosssinae palpalis and morsitans* among the cotton bushes. If this is to be continued, it will be advisable to shift this side of the ferry lower down the river.

3. MEDICAL EXAMINATION OF NATIVES IN VILLAGES.

This must be systematically carried out, but it must be recognized that the conditions in the Gold Coast Colony are different from those obtaining in Togoland. In the latter country the inhabitants of the towns are registered and known to the administration, so that the entire population can be to a great extent checked, whereas in this Colony there is no such possibility as we have no system of registration and, as I have already said, there is nothing to prevent natives from temporarily leaving a town and hiding, rather than undergo a medical examination against their wish.

This has proved a great difficulty for the Sleeping Sickness Commission in Togoland in examining villages bordering on this Colony. They found that, in spite of all their efforts, natives in such villages succeeded in hiding and crossing the frontier into British Territory until the Medical Officer had left the neighbourhood. This has been very noticeable in the Kratchi district and the Supervisor of Customs in that district called attention in December last, to the large number of immigrants who had crossed from Togoland and were staying temporarily in villages near British Kratchi. As these natives apparently considered they had good reasons for avoiding a medical examination for Sleeping Sickness, it is most likely that they might prove very undesirable visitors.

It it also unfortunate that we have no system of Registration of Deaths, which would at once indicate the presence of any epidemic mortality.

I believe that by adopting the methods I did, I was enabled to see and examine more possible cases of Sleeping Sickness than I could have done by attempting to force an examination, but I think it may prove difficult to induce cases to come and remain in hospital for the prolonged period necessary for treatment, unless compulsion is used.

4. LEGISLATION will probably be needed to compel the chiefs and villagers to present themselves for examination by a Medical Officer when called upon, to prevent the concealment of cases, and to insist that every case of the disease be placed under the control of the Medical Officer, in hospital or elsewhere, as he may direct. Deterrent punishment for the evasion of the law should be strongly enforced, and the Ordinance extended to cover the necessary clearing round the towns, &c., as I have recommended.

5. CONTROL OF TRAFFIC AND EXAMINATION OF TRAVELLERS.

This is a most important consideration. I have already pointed out that there is free communication between this district and Togoland across the frontier, and the main part of the Gold Coast across the Volta, but this communication is much more marked at the beginning of, and during the cocoa season (from July to October). At this time, large numbers of natives from the Ho district of Togoland (estimated at 2,000 yearly by the German authorities) cross into the Colony to act as labourers, picking and carrying cocoa and rolling casks, &c., returning afterwards to Togoland. There is also, I am informed by the same authorities, a large number of Gold Coast natives who pass into Togoland to Ho, for the purpose of selling their cocoa.

In order to regulate this traffic there should be (a) Admission from Togoland into the Colony only by recognized roads or ferries guarded by Preventive Service stations, and from the South-East districts of the Colony (across the Volta) only by certain fixed ferries also guarded by Preventive Service stations.

(b) Medical examination of all travellers, and intending travellers, across the frontier between Togoland and this Colony, and also across the Volta from the Volta River District, with rejection or detention of suspicious cases of Sleeping Sickness and certification of those free from the disease.

I have submitted a scheme (Part 3) for the carrying out of these propositions and the other suggestions made.

6. MORE FREQUENT VISITS BY ADMINISTRATIVE OFFICERS, as Travelling and District Commissioners. The district is at present under the control of the District Commissioner of Akuse who was only able to pay a short visit to it during the six months I have spent there. The people are at present but little accustomed to European authority, and very considerable assistance could be rendered by a District Commissioner in warning and notifying the chiefs and people of the regulations made, and enforcing their observance.

It is a cocoa growing district of some importance.

7. DESTRUCTION OF FLIES. LOCALISING OF BREEDING PLACES, &c.

There are excellent opportunities for work in this direction, which should prove of the utmost importance. The elective sites for the deposition of pupae are but little understood at present; although I spent considerable time in searching for pupae in what appeared to be likely spots—such as the basis of oil-palm fronds, light shaded soil on the banks of streams, &c., I could never discover either live pupae or pupa case.

8. SCHOOL INSTRUCTION AS TO THE NATURE OF THE DISEASE, &c.

I believe this will be a very useful way of helping to check the spread of the disease, and have prepared a simply worded lecture on its nature and prevention, which has been given to the boys of the Basel Mission school at Anum. If approved, I would suggest that it be printed and distributed to the Government and Mission schools throughout the Colony, as a supplementary lecture to those on Health and Sanitation which they already receive.

PART III.

For the purpose of putting the above suggestions into practice, I have drawn up a scheme which I believe will prove effective if thoroughly carried out and in January, 1910, I visited the Sleeping Sickness Isolation Camp at Mount Kluto in Togoland to confer with Dr. Zupitza and Dr. Von Raven, of the Schlafk rankheits-kommission in Togo, in order to arrange that the two Colonies might work together to the same purpose. We agreed on all points, and I therefore beg to submit the following plan of action for dealing with the disease.

In considering this plan it is essential to remember that the disease may be carried by Hausa and other traders entering or leaving the Colony at any place along the East and South-East borders, from British Kratchi (and probably higher up) in the north to Quittah, on the sea-coast, in the south. This border may be divided into three portions, the conditions in which differ to some extent.

The upper or northern section may be regarded as extending from British Kratchi to Daino on the 6. 40 parallel. For the whole of this extent the River Volta forms the natural boundary between the Gold Coast Colony and German Togoland, and is

entirely under British control; it is about 400 or more yards broad throughout. There is a ferry of some importance between British Kratchi and Kete-Kratchi on the German side, largely used by traders, and a second ferry is situated near the middle of the stretch between Nkami and Gabe. The British country extending westward from the right bank of the Volta is known as the "Afram plains," lying between the River Afram, which joins the Volta opposite Anum, and British Kratchi. Apart from the small villages on the bank of the Volta, the whole of these plains are uninhabited, except for a few scattered hunters' villages temporarily occupied during the dry seasons; they consist of undulating grass country with small trees, and extend for about fifty miles to the west. A good road runs north from the Afram to Kratchi, roughly parallel to the Volta, and about 1 to 2 miles west of it; it does not however pass through any villages and appears practically unused, traders preferring to pass south through Togoland and the Volta River District.

The middle section bounds the Volta River District as I have described, and may be considered as extending between Daino, near the Volta, on the 6. 40 parallel and Pode on the 6. 20 parallel. It is, as I have said, very largely an artificial boundary, as the river Shawo, running between the two parallels, is small and of little account in the dry season. The roads and trade routes have been already described and are shown in the attached map, in which the more important trade routes are broadly marked in red.

The southern or lower section is also mainly artificial, extending eastward from Pode along the 6. 20 parallel then on to Quittah on the sea coast. As in the Volta River District, the main roads from Togoland are guarded by Preventive Service Stations.

Thus the Colony between British Kratchi and Daino is guarded by strong natural protections on its eastern side, viz, by the broad River Volta and by

miles of uninhabited plains. South of this, while the boundary between British and German Territory is largely artificial, the Volta forms a protection of some value, cutting off the main part of the Colony from the extreme south-eastern districts.

To protect this boundary and country, four Medical Officers are required as follows :—

1. A Medical Officer to be stationed at Anum, for charge and treatment of cases in hospital. He should be properly equipped with material and apparatus for the further investigation of the disease.

2. A Medical Officer to travel constantly round the South-eastern boundary and Volta River District. He will be empowered to make compulsory examinations of all natives and villages for Sleeping Sickness and enlarged glands, forwarding cases to Anum for treatment. He will see that the special sanitary regulations are carried out, investigate the habits, breeding, and general life conditions of *Glossinae* and other biting flies, and form a collection of such entomogical specimens.

3. A Medical Officer to be stationed at British Kratchi, to deal in the same way with the town and district.

4. A Medical Officer who shall travel by canoe up and down the Volta from Addah to Kratchi, investigating and working in the same way at the villages on the banks the right bank only north of Daino, but, south of this, both banks down to Addah. He will also examine and deal with passengers travelling in canoes. I have found two cases of probable Sleeping Sickness in river villages, and I believe that closer examination than I was able to make may bring more to light.

These Medical Officers will be in touch with the German Medical Officers respectively in the Ho district of Togoland (near the south-eastern border), at Kete-Kratchi and district, and along the left or German bank of the Volta above Daino.

Each such Medical Officer shall be provided with a Control Book and a book of Certificates, preferably of a distinctive colour, marked with the name of his respective district, and framed as follows :—

CERTIFICATE OF HEALTH.

CONTROL STATION. DATE OF ISSUE.

NUMBER.

Name & Left Thumb Mark.

Signs of Sleeping Sickness. (Lymphatic Glands, Blood, etc.)

Sex, and Approximate Age.

Relatives. (Parents or Husband).

Village.

Countersigned by Officer in Charge.

Date. Station.

District.

Other Remarks.

Signature.

Medical Officer.

These certificates shall be filled up and issued to natives travelling, or wishing to travel, from British Territory across the frontier or the Volta, if the Medical Officer is satisfied after examination that they present no signs of Sleeping Sickness. A similar certificate will be issued by German Medical Officers in Togoland, and similar control books or counterfoils kept.

These certificates shall be available for one month from the date of issue, and shall of course apply to men and children. If necessary they may be extended for another month by the Medical Officer of any station in the Colony, after a satisfactory examination.

All certificates to be presented to the native Officer in charge at the Preventive Service Station on the ferry or frontier at which the travellers enter or leave the country, for him to countersign with his name, date and station. Such Officers in Charge to enter in a book specially provided for that purpose, the Number, Name and District shown on the certificate, together with the date seen. By these means the possession of a certificate, and the movements of the native may be shown.

Natives presenting themselves at such ferry or frontier stations without the necessary certificate to be turned back, or if deemed expedient, referred to the nearest Medical Officer for examination and certification.

Heavy punishments should be instituted for falsification of the Certificates, or attempts willingly made to travel without them, or for crossing the frontier except by recognised roads.

The passage of native traders and carriers over the frontier and across the Volta should be rigidly restricted to the following places :—

(1) Ferries over the Volta
at BRITISH KRATCHI—KETE-KRATCHI.
NKAMI—GABE.
PESSE—LABO LABO.
SENKYI—AGOLI.
ADDAH—ATITITI. (on the sea coast.)
others being added as necessary.

(2) Roads entering the Colony.
at DAINO (on 6.40 parallel.)
BRITISH KPEVE "
ANJIRAWASE. (near TSITO, on South eastern boundary.)
AFRANCONDUA, or PODE (on 6.20 parallel,)
and other roads along the frontier to Quittah, as the exigencies of trade may demand, provided that each such road is guarded by a Preventive Service Station.

In this scheme it is apparent that the effective carrying out of the proposals depends largely upon an efficient Preventive Service on the East and South-east borders of the Colony, and on the lower reaches of the Volta below Daino, but it will be seen that the suggested service from this Department is little more than the duties they already perform.

It depends mainly on efficient policing of the frontier and river, with some additional responsibility and work (mainly clerical) for the native Officers in Charge of the frontier and ferry stations. There is no intention of placing any such medical work as the palpation for enlarged glands, in the hands of any of these officials whose duties, with regards to travellers, will consist of inspecting and countersigning

their certificates of health, and rejecting, or referring to the nearest Medical Officer, those travellers who have neglected to provide themselves with certificates.

If necessary, Certificates of Health may also be issued to natives, after satisfactory examination, by the Medical Officers stationed at Quittah, Addah and Akuse (near Senkyi), the name of the Control Station being in each case marked on the certificate, and a corresponding Control Book being kept by each such Medical Officer.

By this organization I believe the disease may be dealt with on the Eastern border of the Colony with as little as possible dislocation of trade or interference with the liberty of the native.

APPENDIX I.

A SCREENED HOSPITAL for SLEEPING SICKNESS is now being erected on the range of hills by Anum in the Volta River District, overlooking the Volta and the Afram Plains to the North and West. This I believe to be the most suitable position of any in the District; it is about 800 feet above sea level and about half a mile from the town of Anum from which it is approached by a sloping road; other roads also lead from it to Doade (opposite Mpeasem on the Volta,) to the Labo Labo ferry, and to the main road between Daino in the North and Anum.

The hill is covered with forest and undergrowth, which had to be cleared for about four acres to enable the hospital site to be definitely chosen; this clearing will be completed and extended, and planted with Bahamas (Doube) grass, when I believe that the whole top of the hill can be made entirely free from Tsetse fly. The north-west face of the hill has been extensively cleared, and grass planted. The range extends

to the north-east and affords sufficient facilities for considerable extension of hospital buildings if necessary. On the north-west the hill falls very rapidly to the Volta valley.

Originally plans were made for a wooden building resting on low piers, but I found it advisable to alter this to one of stone and swish resting on a cement foundation, for the following reason; there would have been considerable delay in starting the building, owing to the difficulty in obtaining suitable timber locally, and a building of stone is not only more durable, but is more suitable for preserving an equable temperature, a factor of some importance in a place like Anum, where there is great variation in temperature at different seasons of the year. There was plenty of suitable stone on the site selected, and the cost, I am informed, will not exceed that allowed for the original design. In other respects the building will be as originally planned in all essential respects, with one large ward to accommodate twelve cases and a smaller observation ward to hold six cases. A separate cook-house of swish, and a building of stone and swish with two rooms, for a dispenser and dresser, have also been erected.

Although there is no doubt that one large hospital, such as the one under erection, is advisable for the proper investigation and treatment of suitable cases, yet it will probably be found in the future, if additions are required, that it may be preferable to build a series of swish huts about nine feet square for the accommodation, for example, of a man and his wife, or a child and its mother, as is done in Togoland. By this means it will be easier to retain patients who are allowed to have a member of their family with them, than those who are removed from their home and separated from their friends; this will apply to less advanced cases, and to cases "*en bon etat*,"

whom it may prove difficult to keep under treatment sufficiently long for success to be hoped for, while the fact of the hill being itself fly-proof when properly cleared will render less urgent the need of closely immuring the patients.

A small laboratory, about twelve feet square, should be built near to the north-east end of the hospital, and properly equipped. It is necessary, both for microscopic investigation and for the aseptic preparation of drugs to be administered by intramuscular or hypodermic injection.

The Water Supply will be derived from a large underground tank which collects the rain-water from the roof of the bungalow erected on the hill, near the Basel Mission, about fourteen years ago. The tank is apparently cracked at present, as it does not retain much water, but, when put in repair, it should easily hold sufficient water for the present purposes. In the event of any large extension of the hospital or camp, additional arrangements might be necessary—for instance, a rain-water tank attached to the present hospital. There is, unfortunately, no spring available on the hill, but possibly a well might be bored, and water obtained at its foot.

Residential quarters for a Medical Officer are available in the present bungalow which would require furnishing.

APPENDIX II.

In January, 1910, I visited the Sleeping Sickness Camp in German Togoland. The camp has been formed by, and is under the control of the Special Service Medical Officers forming the "Schlaf-krankheits-kommission in Togo," including Dr. von Raven and Dr. von der Heller, under the command of Dr. Zupitza.

It was formerly placed on the top of the "Hausberg," a high hill on which meteorological observations are made, but has now been removed to a more suitable site at Mount Kluto, about a mile and a half away. Mount Kluto is a large hill, about 550 metres high (nearly 1,800 feet,) forming part of the range of hills by Misahohe, over which the main road passes north to Kpando. Like most of the country in the neighbourhood and in the south, Mount Kluto has very little forest vegetation, being chiefly covered with coarse grass; it was therefore easily adapted for the purposes of a camp, as there is ample room for expansion on its broad summit and it is practically free from fly. Apart from the cold morning wind and the low night temperature, it is an essential site, being near to the Station of Misahohe (half an hour's walk) and only a little more than 5 kilometres from Agome-Palime, which is the railhead of the main line from Lome, the capital of Togo. It is therefore easily in touch with Kpando and the north by road, and with the south by the railway, while a good road runs from it to the Ho district and south-west.

The camp consists of forty three-roomed huts placed in pairs on each side of a broad central road; the huts are ordinary native huts built of swish, with a grass roof; the rooms are about 9 feet square, with the floor slightly raised above the outside level, and they have no doors. There is an open market place in the middle of the camp in which natives from Misahohe and the neighbouring towns sell food, at slightly enhanced prices, to the patients and their friends. At the south end of the camp are the Medical Officer's quarters, Library, Laboratory, and a small mosquito-proof house in which animals for experimental purposes are kept. Good water is obtained from a spring on a hill about half a mile away, which has also been fitted up for washing purposes. The water for use in camp is carried from the spring by the patients and their friends.

The patients are relieved of all Government taxes while in the camp, and are encouraged to pursue their usual trades or avocations, such as weaving, &c. The camp is kept clean and in good sanitary condition by three and a half hours' daily work on the part of those patients who are able to work, and their friends. Each patient is allowed to have one relative or friend with him, who shares his room.

Food is not provided for the patients, but a daily allowance of 40 pfennigs (about fourpence halfpenny) is made to each patient, together with a daily allowance of 20 pfennigs (about twopence halfpenny) to one friend, so that they are enabled to buy their own food in the market provided. There is some difficulty in obtaining fuel, which has to be brought from a distance.

Two orderlies are present in camp for disciplinary purposes.

None of the buildings are screened or made "fly-proof" and patients in all stages of the disease occupy the huts as above described. The site on the hill is considered sufficiently fly-proof to render no other steps necessary.

Dr. von Raven is in charge of the camp and remains at Mount Kluto, while Dr. Zupitza and Dr. von der Heller have been travelling about searching for cases of Sleeping Sickness. At the time of my visit there were 80 cases under treatment in the camp, 30 having been recently discharged to their homes with instructions to report themselves monthly at Mount Kluto.

It is unfortunate that, owing to epidemic Small Pox in the northern districts, both Dr. Zupitza and Dr. von der Heller had been obliged to temporarily relinquish their search for Sleeping Sickness, and to travel about vaccinating instead. It is possible owing to this that the number of cases has apparently diminished of late.

Dr. Zupitza also informed me that the work is handicapped by lack of funds, and that he considers it essential that they should have another Medical Officer who should be entirely devoted to Sleeping Sickness work. He finds that the disease is more prevalent in the north-west part of Togo, and is spreading towards the east.

Treatment. Arsenophenylglycin is now chiefly used. It is a yellow powder of which 0.5 gram is put up and preserved in vacuo in glass capsules; the compound is very unstable and rapidly decomposes on exposure to air, or to warm water. It is administered by intramuscular injection of the salt, dissolved in cold water, the dose being 0.5 gram (about seven and three-quarter grains) for a child of about six years, and 1.0 gram (about fifteen and a half grains) for an adult. This injection is given on two consecutive days unless the Temperature remains high on the second day when the injection is due, in which case the second injection is not given as it has been found to be dangerous under these conditions. After these initial injections the Temperature is taken thrice daily and, if raised, the blood of lymph-glands are constantly examined for Trypanosomes; as long, however as the Temperature remains normal, systematic examination of the blood or glands is made every ten days. If no Trypanosomes are found, and there are no untoward symptoms, no more treatment is required; such a patient stays in the camp for six months, and is then discharged with instructions to report himself at the camp monthly for four more months.

Dr. von Raven has found cases with no signs of Sleeping Sickness for six and eight months after the initial injection of Arsenophenylglycin, the glands becoming smaller and the Trypanosomes disappearing, but the treatment is only of use in the early stages, *i e.* before lethargy or mental symptoms develop.

If relapse occurs, the two injections are repeated and the case again watched, but should another relapse occur, treatment by Arsenophenylglycin is discontinued as useless, in such a case, Atoxyl is given intramuscularly, 0.5 gram on 10th and 11th days for an indefinite period, supplemented, in the intervals of injection, by Orpiment (Auripigment) as follows :—

Treatment by Orpiment.

Orpiment is given on alternate days only, starting for an adult, with 0.03 gram (about half a grain approximately) by mouth three times daily on the first day, and afterwards increasing the last total daily dose by 0.03 gram. This ascending scale of administration is continued until a maximum amount of 0.3 gram of Orpiment is taken in one day (i. e. approximately four and a half grains,) which amount may be maintained for a week or a fortnight, judging by the clinical symtoms of the patient; it is then decreased in precisely the same ratio.

If there is no improvement after this course of treatment, Atoxyl injections are used alone.

In concluding this short account of the excellent work being carried on in Togoland I wish to express my acknowledgement of the courtesy and hospitality which I received from the Government of Togoland and from every German Official whom I met, particularly Dr. Zupitza and Dr. von Raven, whose kindness rendered my stay with them a most pleasant recollection.

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Anum Volta River District.
9th February, 1910.

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